

What is claimed is:

1. An implantable physiological or pathophysiological biosensor comprising:

5 tissue or cells capable of carrying out a physiological or pathophysiological function, wherein the tissue or cells are coupled via an electrical interface to an electronic measuring device or an electronic amplifying device and wherein the biosensor may be used to monitor a chemical, physiological or pathophysiological variable associated with the physiological or  
10 pathophysiological function.

2. An implantable physiological or pathophysiological biosensor comprising:

tissue or cells capable of carrying out a physiological or pathophysiological function, wherein the tissue or cells are coupled via an  
15 electrical interface to endogenous tissue or cells, including the blood, and wherein the biosensor may be used to monitor a chemical, physiological or pathophysiological variable associated with the physiological or pathophysiological function.

20 3. The biosensor according to claim 1 or 2 , wherein the tissue or cells are excitable tissue or cells.

4. The biosensor according to claim 3 , wherein the excitable tissue or cells are cardiac tissue or cells.

5. The biosensor according to claim 3, wherein the tissue or cells are neuronal tissue or cells.

25 6. The biosensor according to claim 1 or 2 , wherein the tissue or cells are molecularly, genetically, or cellularly engineered.

7. The biosensor according to claim 1 or 2, wherein the physiological or pathophysiological variable is heart rate regulation or heart rate dynamics.

30 8. The biosensor according to claim 1 or 2, wherein the physiological or pathophysiological variable is a level or activity of at least one of blood glucose, insulin, thyroid hormone, clotting factors or components, endocrine

hormone, paracrine hormone, autocrine hormone, antibodies, receptor antagonists, ligands, antigens, antagonists, signal pathway cofactors, signal pathway components, pathogens, drugs, metabolites, or toxins.

9. The biosensor according to claim 1 or 2, wherein the biosensor is  
5 implanted or inserted in an animal.

10. The biosensor according to claim 9 wherein the animal is a  
mammal.

11. The biosensor according to claim 10, wherein the mammal is  
selected from the group consisting of a mouse, rat, rabbit, pig, cat, dog, cattle,  
10 horse, and sheep.

12. The biosensor according to claim 10, wherein the mammal is a  
human.

13. The biosensor according to claim 1 or claim 2 wherein the tissue or  
cells are incorporated within a device.

15 14. The biosensor of claim 13 wherein the device is at least one of a  
tube, tubing, catheter, wire, wire leads, or an electronic pacemaker.

15. A method for monitoring a physiological or pathophysiological  
function, said method comprising:

20 placing into a subject, tissue or cells capable of carrying out a  
physiological or pathophysiological function within the subject, wherein the tissue  
or cells may be used to monitor a chemical, physiological or pathophysiological  
variable associated with the physiological or pathophysiological function of the  
subject, and ;

25 monitoring the physiological or pathophysiological function of the  
exogenous tissue or cells placed therein.

16. The method according to claim 15, wherein the tissue or cells are  
excitable tissue or cells.

17. The method according to claim 16 wherein the excitable tissue or  
cells are cardiac tissue or cells.

18. The method according to claim 16, wherein the excitable tissue or cells are neuronal tissue or cells.

19. The method according to claim 15, wherein the tissue or cells are coupled via an electrical interface to endogenous tissue or cells.

5 20. The method according to claim 15, wherein the tissue or cells are coupled via an electrical interface to an electronic measuring device or an electric amplifying device.

21. The method according to claim 15, wherein the tissue or cells are molecularly, genetically, or cellularly engineered.

10 22. The method according to claim 15, wherein the physiological or pathophysiological variable is heart rate regulation or heart rate dynamics.

23. The method according to claim 15, wherein the chemical, physiological or pathophysiological variable is a level or activity of at least one of blood glucose, insulin, thyroid hormone, clotting factors and components, 15 endocrine hormone, paracrine hormone, autocrine hormone, antibodies, receptor antagonists, ligands, antigens, antagonists, signal pathway cofactors, signal pathway components, pathogens, drugs, metabolites, or toxins.

24. The method according to claim 15, wherein the tissue or cells are incorporated into a device that is placed inside an animal.

20 25. The method of claim 24 wherein the device is at least one of a tube, tubing, catheter, wire, wire leads, or an electronic pacemaker.

26. The method according to claim 24, wherein the animal is a mammal.

27. The method according to claim 26, wherein the mammal is selected 25 from the group consisting of a mouse, rat, rabbit, pig, cat, dog, cattle, horse, and sheep.

28. The method according to claim 26, wherein the mammal is a human.

29. A method of regulating output of a signal, substance, or action in a subject, said method comprising:

5 placing within the subject, exogenous tissue or cells capable of carrying out a physiological or pathophysiological function, wherein the exogenous tissue or cells may be used to monitor a chemical, physiological or pathophysiological variable associated with the physiological or pathophysiological function;

coupling the exogenous tissue or cells to an interventional device or a delivery device; and

10 regulating the output of a signal, substance, or action from the interventional device or delivery device in response to the physiological or pathophysiological function of the exogenous tissue or cells.

30. The method according to claim 29, wherein the signal is an electrical signal.

15 31. The method according to claim 29, wherein the signal is a chemical signal.

32. The method according to claim 29, wherein the tissue or cells are excitable tissue or cells.

33. The method according to claim 32, wherein the excitable tissue or cells are cardiac tissue or cells.

20 34. The method according to claim 32, wherein the excitable tissue or cells are neuronal tissue or cells.

35. The method according to claim 29, wherein the tissue or cells are molecularly, genetically, or cellularly engineered.

25 36. The method according to claim 29, wherein the physiological or pathophysiological variable is heart rate regulation or heart rate dynamics.

37. The method according to claim 29, wherein the chemical, physiological or pathophysiological variable is a level or activity of at least one of blood glucose, insulin, thyroid hormone, clotting factors and components, endocrine hormone, paracrine hormone, autocrine hormone, antibodies, receptor

antagonists, ligands, antigens, antagonists, signal pathway cofactors, signal pathway components, pathogens, drugs, metabolites or toxins.

38. The method according to claim 29, wherein the tissue or cells are implanted in a mammal.

5 39. The method according to claim 29, wherein the tissue or cells are incorporated into a device that is placed inside the subject.

40. The method of claim 39 wherein the device is at least one of a tube, tubing, catheter, wire, wire leads, or an electronic pacemaker.

10 41. The method according to claim 38, wherein the mammal is selected from the group consisting of a mouse, rat, rabbit, pig, cat, dog, cattle, horse, and sheep.

42. The method according to claim 38, wherein the mammal is a human.

15 43. The method according to claim 29, wherein the delivery device delivers a drug or compound.

44. The method according to claim 29 wherein the interventional device is an alarm system or mechanical device.

45. The method according to claim 29 wherein the delivery device is a an electronic pacemaker, insulin pump, or drug pump.

20 46. The method according to claim 29, wherein the delivery device delivers electrical stimuli or mechanical stimuli.

47. A system for controlling heart function comprising:

exogenous tissue or cells placed within a subject; and

25 an electrical connection placed between the exogenous tissue or cells and the natural pacemaker region of the heart, wherein the exogenous tissue or cells are capable or carrying out a physiological or pathophysiological function and may be used to monitor a chemical, physiological or pathophysiological variable associated with the physiological or pathophysiological function.

48. The system according to claim 47 further comprising:

an amplifier to boost the signal from the exogenous tissue or cells.

49. The system according to claim 47 wherein the exogenous tissue is connected to an electronic pacemaker.

50. The system according to claim 47 wherein the exogenous tissue comprises cells which are molecularly, genetically, or cellularly engineered.

51. The system according to claim 47 wherein the exogenous tissue or cells are incorporated into a device that is placed inside the subject.

52. The system of claim 51 wherein the device is at least one of a tube, tubing, catheter, wire, or wire leads.

10 53. The system according to claim 47 wherein the exogenous tissue or cells are cardiac or neuronal tissue or cells.